NASA SP-7037 (311)
December 1994

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC 1994

This publication was prepared by the NASA Center for AeroSpace Information,
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INTRODUCTION

This issue of *Aeronautical Engineering — A Continuing Bibliography with Indexes* (NASA SP-7037) lists 4 reports, journal articles, and other documents recently announced in the NASA STI Database.

Accession numbers cited in this issue include:

Scientific and Technical Aerospace Reports (STAR) (N-10000 Series)	None in this issue
Open Literature (A-60000 Series)	A94-62341 — A94-62589

The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by the first nine *STAR* specific categories and the remaining *STAR* major categories. This arrangement offers the user the most advantageous breakdown for individual objectives. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract number, report number, and accession number—are included.

A cumulative index for 1994 will be published in early 1995.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.

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TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED
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ACCESSION NUMBER → **N94-10675*#** National Aeronautics and Space Administration. ← CORPORATE SOURCE
Langley Research Center, Hampton, VA.

TITLE → **STATIC INTERNAL PERFORMANCE OF A SINGLE EXPANSION RAMP NOZZLE WITH MULTIAXIS THRUST VECTORING CAPABILITY**

AUTHORS → FRANCIS J. CAPONE and ALBERTO W. SCHIRMER (George Washington Univ., Hampton, VA.) Washington Jul. 1993 ← PUBLICATION DATE
272 p

CONTRACT NUMBER → (Contract RTOP 505-62-30-01)

REPORT NUMBERS → (NASA-TM-4450; L-17163; NAS 1.15:4450) Avail: CASI HC A12/ ← AVAILABILITY AND PRICE CODE
MF A03

An investigation was conducted at static conditions in order to determine the internal performance characteristics of a multiaxis thrust vectoring single expansion ramp nozzle. Yaw vectoring was achieved by deflecting yaw flaps in the nozzle sidewall into the nozzle exhaust flow. In order to eliminate any physical interference between the variable angle yaw flap deflected into the exhaust flow and the nozzle upper ramp and lower flap which were deflected for pitch vectoring, the downstream corners of both the nozzle ramp and lower flap were cut off to allow for up to 30 deg of yaw vectoring. The effects of nozzle upper ramp and lower flap cutout, yaw flap hinge line location and hinge inclination angle, sidewall containment, geometric pitch vector angle, and geometric yaw vector angle were studied. This investigation was conducted in the static-test facility of the Langley 16-foot Transonic Tunnel at nozzle pressure ratios up to 8.0. Author (revised)

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

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ACCESSION NUMBER → **A94-60042*** National Aeronautics and Space Administration. ← CORPORATE SOURCE
Lewis Research Center, Cleveland, OH.

TITLE → **EXPERIMENTAL INVESTIGATION OF COUNTER-ROTATING PROPFAN FLUTTER AT CRUISE CONDITIONS**

AUTHORS → ORAL MEHMED NASA Lewis Research Center, Cleveland, OH and ← AUTHOR'S AFFILIATION
ANATOLE P. KURKOV *Journal of Propulsion and Power* (ISSN ← JOURNAL TITLE

PUBLICATION DATE → 0748-4658) vol. 10, no. 3 May-June 1994 p. 343-347 refs

REPORT NUMBER → (BTN-94-EIX94321333310) Copyright

This article presents wind-tunnel experimental flutter results, at transonic relative flows, for a 0.62-m-diam composite propfan model. A blade row that fluttered was tested alone, and with a stable aft counter-rotating blade row. The major objectives of the experiment were to study the effect of the second blade row on the row in flutter, and to investigate the flutter. Results show that the second row had a small stabilizing effect. Two distinct flutter modes were found within the operating regime of the rotor: both apparently single-degree-of-freedom instabilities, associated respectively with the first and second natural blade modes. For both flutter modes, flutter boundary, frequency, nodal diameter, and blade displacement data are given. The blade displacement data, obtained with an optical method, gives an indication of the flutter mode shape at a span near the blade tip. Author (EI)

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 311)

December 1994

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

A94-62419
DEVELOPMENT OF HELICOPTER DESIGN CAPABILITY PROGRESS FROM 1970 TO 1993: THE 1993 ALEXANDER A. NIKOLSKY LECTURE
KENNETH I. GRINA The Boeing Company, Seattle, WA, US
Journal of the American Helicopter Society (ISSN 0002-8711) vol. 39, no. 1 January 1994 p. 3-16
(HTN-94-00290) Copyright

The development of helicopter design from 1970 to 1993 is presented. The lecture concentrates on research and development at Boeing Helicopters and emphasizes design developments in rotor systems, vibration control systems, transmissions, flight control systems, and fuselage design. The progress made in helicopter technology in the past twenty years has produced the ability to reduce maintenance, increase speed, lower weight empty ratios, reduce manufacturing costs, and extend the use of future helicopters and tilt rotors. Herner

A94-62424* National Aeronautics and Space Administration, Washington, DC.
FLIGHT SERVICE EVALUATION OF COMPOSITE HELICOPTER COMPONENTS
GEORGE H. MARDOIAN Sikorsky Aircraft, Stratford, CT, US and MAUREEN B. EZZO Sikorsky Aircraft, Stratford, CT, US
Journal of the American Helicopter Society (ISSN 0002-8711) vol. 39, no. 1 January 1994 p. 31-40
(HTN-94-00295) Copyright

This paper presents the results of a NASA funded contract and Sikorsky research and development programs to evaluate structural composite components in flight service on Sikorsky Model S-76 helicopters. Selected components were removed and tested at prescribed intervals over a nine year time frame. Four horizontal stabilizers and thirteen tail rotor spars were returned from commercial service in West Palm Beach, Florida and in the Gulf Coast region of Louisiana to determine the long term effects of operations in hot and humid climates on component performance. Concurrent with the flight component evaluation, panels of materials used in their fabrication were exposed to the environment in ground racks. Selected panels were tested annually to determine the effects of exposure on physical and mechanical properties. The results of 55,741 component flight hours and 911 months of field exposure are reported and compared with initial Federal Aviation Administration (FAA) certification data. The findings of this program have provided increased confidence in the long term durability of advanced composite materials used in helicopter structural applications.
Author (revised by Herner)

A94-62425
THERMALLY INDUCED TWIST IN COMPOSITE TUBES AND THEIR APPLICATIONS TO HELICOPTER ROTOR BLADES WITH CONTROLLABLE TWIST
NAKI TUTUNCU Cukurova Univ., Adana, Turkey and STEVEN J. WINCKLER Rensselaer Polytechnic Institute, Troy, NY, US
Journal of the American Helicopter Society (ISSN 0002-8711) vol. 39, no. 1 January 1994 p. 41-49
(HTN-94-00296) Copyright

Controlled thermally induced twist of a composite rotor blade modeled as a single-cell cross section shell is investigated. Using the anisotropic thermal expansion properties of composite materials, considerable twist can be induced thermally. The twist rate of a non-circular thin-walled cross section is obtained using the thermal shear strain calculated using Classical Laminated Plate Theory. The results show that a significant amount of thermal twist can be induced within a temperature change of 100 F. In addition, scaling the wall thickness does not affect the magnitude of thermal strains; hence, the composite shell can be made as stiff as desired without compromising the required thermal twist. Effects of hygrothermal degradation on thermal shear is discussed. By using hybrids with vast differences in thermal expansion coefficients, even in fiber-dominated mode, which is the least affected by hygrothermal environment, substantial thermal twist is obtained. Maximizing the thermal twist rate, which involved both material and geometric parameters, is discussed, and a thermal shear optimization parameter is suggested. Finally, an example application to rotor blades is presented. Author (revised by Herner)

13
GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

A94-62441*
STRUCTURAL ANALYSIS OF AIRBORNE FLUX ESTIMATES OVER A REGION
PAULO CARAMORI McGill Univ., Macdonald Campus, Montreal, Quebec, Canada, PETER SCHUEPP McGill Univ., Macdonald Campus, Montreal, Quebec, Canada, RAYMOND DESJARDINS Centre of Land and Biological Resources, Ottawa, Canada, and IAN MACPHERSON National Research Council of Canada, Ottawa, Canada *Journal of Climate* (ISSN 0894-8755) vol. 7, no. 5 May 1994 p. 627-640 Research sponsored by the Canadian Natural Science and Engineering Research Council; the Atmospheric Environment Service of Canada; the IAPAR; Embrapa; NASA (FIFE); the Canadian Northern Wetland Study; and the San Joaquin Valley Air Quality Study
(HTN-94-00748) Copyright

Aircraft-based observations of turbulence fields of velocity, moisture, and temperature are used to study coherent turbulent structures that dominate turbulent transfer of moisture and heat above three different eco-systems. Flux traces are defragmented, to reconstruct the presumed full size (along the sampled transect) of

these structures, and flux traces are simplified by elimination of those that contribute negligibly to the flux estimate. Structures are analyzed in terms of size, spatial distribution, and contribution to the flux, in the four 'quadrant' modes of eddy-covariance transfer (excess up/down and deficit up/down). The effect of nonlinear detrending of moisture and temperature data on this 'structural analysis,' over surfaces with heterogeneous surface wetness, is also examined. Results over grassland, wetland, and moist and dry agricultural land, show that nonlinear detrending may provide a more physically realistic description of structures. Significant differences are observed between structure size and associated relative flux contribution, between moist and dry areas, with smaller structures playing a more important role over the moist areas. Structure size generally increases with height, as spatial reorganization from smaller structures into larger ones takes place. This coincides with a gradual loss of surface 'signature' (position and clustering of plumes above localized source areas). The data are expected to provide a basis for an eventual statistical description of boundary layer transfer events, and help to interpret the link between boundary-layer transfer and hydrological surface conditions.

Author (revised by Herner)

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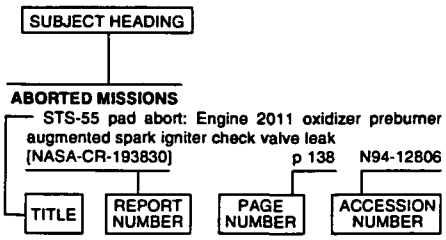

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V

W

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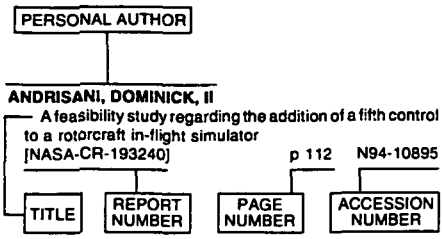

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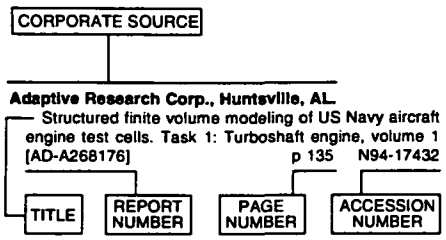

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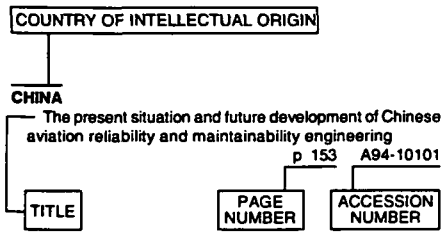
N

National Aeronautics and Space Administration, Washington, DC.
Flight service evaluation of composite helicopter components
[HTN-94-00295] p 609 A94-62424

Typical Foreign Technology Index Listing



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C

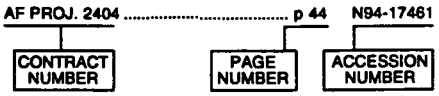
CANADA
Structural analysis of airborne flux estimates over a region
[HTN-94-00748] p 609 A94-62441

T

TURKEY
Thermally induced twist in composite tubes and their applications to helicopter rotor blades with controllable twist
[HTN-94-00296] p 609 A94-62425

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



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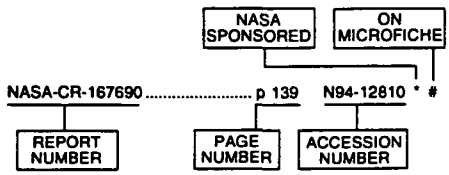

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HTN-94-00290 ..... p 609 A94-62419
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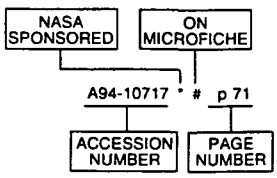

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REPORT DOCUMENT PAGE

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15. *Supplementary Notes*

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Logan, UT 84322-3000
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